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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/647,247 | 08/26/2003 | Hajime Yamamoto | 031029 | 1773 |

38834 7590 10/12/2010
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| EXAMINER |
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CHACKO DAVIS, DABORAH

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| ART UNIT | PAPER NUMBER |
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1722

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| NOTIFICATION DATE | DELIVERY MODE |
|-------------------|---------------|

10/12/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| | | | |
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| Office Action Summary | Application No. 10/647,247 | Applicant(s) YAMAMOTO ET AL. | |
| | Examiner DABORAH CHACKO DAVIS | Art Unit 1795 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period **will** apply and **will** expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply **will**, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07/19/2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,5-11,14-19 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,5-11,14-19 and 21-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3, 5-6, 8, 10-11, 14-15, and 18-19, are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1152036 (Kanda et al., hereinafter referred to as Kanda) in view of U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri).

Kanda, in the abstract, in [0001], [0022], [0023], [0024], [0025], [0026], [0034], [0035], and in Table I, discloses forming a semiconductor device by forming a resist pattern on the substrate, coating the resist pattern with a resin composition (the claimed forming the resist pattern smoothing material) and subjecting the coated resist pattern to a heat treatment, wherein the thickness of the resin coated onto the resist pattern and the heat treatment is adjusted (suitably determined), followed by developing the coating layer (smoothing layer) resulting in the smoothed resist pattern (resist pattern with smooth side walls, wall surfaces etc). Kanda, in [0024], lines 57-58, and on page 5, lines 1, discloses that the water-soluble resin-coated resist pattern is exposed and developed and heated to at least 85°C, i.e., it will inherently cause the resist walls to smooth forming a smooth resist pattern. Kanda, in [0032], discloses that the resist layer forms a resist opening (hole in positive resist) that corresponds to the exposure

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performed (claim 1). Kanda in [0031], [0032], [0033], [0034], [0035], [0036], [0037], and in Table 1, discloses that the resist patterns formed are without fish eyes or striations at all, i.e., the average opening dimension is greater than 90% of the predetermined opening dimension, and Table I (indicating the characteristics) of Kanda reveals that the maximum and minimum opening dimensions (resist openings that are smoothed, without striations and are uniform) are within a range of $\pm 3\%$ of the predetermined opening dimension. Kanda, in [0023], discloses that the resist is an ArF resist (claims 3, 5, and 6). Kanda, in [0023], discloses that the coating layer is heated in the claimed range (80 - 100°C) (claim 8). Kanda, in [0006], and [0007], discloses that the water-soluble resin composition (coating layer) includes a resin, a surface-active agent, and a crosslinking agent, and is water-soluble (claims 10-11). Kanda, in [0016], discloses that the surfactant is a non-ionic surfactant such as an alkoxylate compound (ethoxylate compound) or alcohols. Kanda, in [0009], and [0011], discloses that the resin is a polyvinyl alcohol, the crosslinking agent is a melamine derivative, and the claimed resin (Claims 14-15). Kanda, in [0019], discloses that the organic solvent is an alcohol solvent (claims 18-19).

The difference between the claims and Kanda is that Kanda does not disclose that the surface active agent (surfactant) is one recited in claim 1.

Mouri, in paragraph nos. [0109] through [0112], discloses that a coating layer composition includes a water-soluble resin includes a cationic surfactant, and amphoteric surfactants.

Therefore, it would be obvious to a skilled artisan to modify Kanda by employing cationic an/or amphoteric surfactants as suggested by Mouri in the resin composition because Kanda, in [0016], discloses that the resist pattern smoothing material comprise a surface active agent (surfactant) and in [0022], and [0024], discloses that using the water-soluble resin composition that comprises the surfactant, enables the coating of the already formed resist pattern and using the coated resist pattern to form a trench pattern of a hole pattern that is fine.

3. Claim 7, is rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1152036 (Kanda et al., hereinafter referred to as Kanda) in view of U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri) as applied to claims 1, 3, 5-6, 8-11, 14-15, 18-19, above, and further in view of U. S. Patent No. 6,043,145 (Suzuki et al., hereinafter referred to as Suzuki).

Kanda in view of Mouri is discussed in paragraph no. 2.

The difference between the claim and Kanda in view of Mouri is that Kanda in view of Mouri does not disclose that the smoothed resist pattern has an opening dimension within the range of 50nm to 150nm (claim 7).

Suzuki, in col 4, lines 38-45, discloses that the resist pattern dimensions are increasingly narrowed such that the width (opening dimension of a pattern) of the pattern is 0.15μ (i.e., 150nm).

Therefore, it would be obvious to a skilled artisan to modify Kanda in view of Mouri by employing the opening dimension (width) suggested by Suzuki because Kanda, in [0036], discloses that the resist pattern width (opening of the LSI's) is reduced

and smoothed and in [0002], and [0039], discloses that the LSI fabricated in the claimed method would possess reduced spaces (width) in the trenches or holes due to the thickening of the resist.

4. Claims 16-17, are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1152036 (Kanda et al., hereinafter referred to as Kanda) in view of U. S. Patent Application Publication No. 2002/0012035 (Mouri et al., hereinafter referred to as Mouri) as applied to claims 1, 3, 5-6, 8-11, 14-15, 18-19, above, and further in view of U. S. Patent No. 6,537,719 (Takahashi) and U. S. Patent No. 6,555,617 (Tanaka et al., hereinafter referred to as Tanaka).

Kanda in view of Mouri is discussed in paragraph no. 2.

The difference between the claims and Kanda in view of Mouri is that Kanda in view of Mouri does not disclose that the resist pattern smoothing material (resin composition) comprises one of a water-soluble aromatic compound and resin having an aromatic compound (claim 16). Kanda in view of Mouri does not disclose the water-soluble aromatic compound recited in claim 17, and does not disclose the resin aromatic compound recited in claim 17.

Takahashi, in col 6, lines 11-42, discloses that the alkali-soluble photosensitive composition (resin) can be aromatic and that the composition includes an aromatic compound such as alcohol derivatives of naphthalene (naphthol).

The difference between the claims and Kanda in view of Mouri further in view of Takahashi is that Kanda in view of Mouri further in view of Takahashi does not disclose the claimed resin containing an aromatic compound.

Tanaka, in col 3, lines 16-64, discloses that the resin composition includes a polyvinyl aryl acetal resin (resin containing an aromatic compound).

Therefore, it would be obvious to modify Kanda in view of Mouri by employing the aromatic compound suggested by Takahashi because Takahashi, in col 4, lines 8-16, in col 5, lines 7-20, and in col 6, lines 11-40, and in col 12, lines 40-47, discloses that employing the suggested aromatic phenolic resin is preferable for the formation of a radiation sensitive resin composition so as to enable combination with a fluorescent material without impairing the characteristics of the resist. It would be obvious to a skilled artisan to modify Kanda in view of Mouri further in view of Takahashi by employing the resin containing the aromatic compound because Kanda in [0009], discloses that the resin composition includes a polyvinyl acetal resin, and Tanaka, in col 3, lines 35-56, and in col 5, lines 34-36, and in col 6, lines 38-43, discloses that the resin composition that includes the polyvinyl acetal resin is modified by including an aryl group in the polyvinyl acetal structural unit, and doing so improves the glass transition temperature and heat resistance of the modified coating resin, and that the modified polyvinyl acetal aryl resin is applicable as a coating material due to its adhesiveness and film-forming properties.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA

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1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 1, 3, 5-11, 14-19, 21-26, are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 7,416,837 (Nozaki et al.) Although the conflicting claims are not identical, they are not patentably distinct from each other because both claim forming resist pattern with smoothed or reduced edge roughness using the same method steps include applying a smoothing or resist pattern improving material to the resist pattern, heating and developing.

Response to Arguments

7. Applicant's arguments, see Amendment and Remarks, filed July 19, 2010, have been fully considered but they are not persuasive. The 35 U.S.C. 103(a) rejections made in the previous office action have been maintained.

A) Applicants argue that Kanda does not disclose the claimed opening dimension, and that the reduction of the space in the resist pattern is larger than the claimed amount.

Kanda in [0031], [0032], [0033], [0034], [0035], [0036], [0037], and in Table 1, discloses that the resist patterns formed are without fish eyes or striations at all, i.e., the

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average opening dimension is greater than 90% of the predetermined opening dimension, and Table I (indicating the characteristics) of Kanda reveals that the maximum and minimum opening dimensions are within a range of $\pm 3\%$ of the predetermined opening dimension (see paragraph no. [0035]). Kanda in paragraph nos. [0025], [0026], [0027], [0028], discusses that the resist pattern that is coated with the water-soluble resin composition is heated and crosslinked, and the non-crosslinked portions of coated water-soluble resin (resist pattern smoothing material) are removed, and not the previously formed resist pattern (resist pattern without the water-soluble resin coated onto its surface), and that only portions of the coated water-soluble resin that are crosslinked with the resist pattern remain. And as disclosed by Kanda (in the preceding sentence) the range of maximum to minimum in the opening dimension is within $\pm 3\%$. The instant claim 1, recites a resist pattern, and the formation of a resist pattern smoothing material on the formed resist pattern, and that at least one of an application thickness of the resist pattern smoothing material and heat temperature for the heating is adjusted so as to smooth at least the wall surfaces of the resist pattern. Kanda teaches a resist pattern and forming a coating layer (the claimed resist pattern smoothing material) on the resist pattern and heating the coating material coated resist pattern i.e., the heating process will cause the surface of the coated resist pattern to smooth the walls of the resist pattern such that there are no striations i.e., the smoothed resist pattern will have the claimed opening dimensions, and as discussed in Kanda in paragraph no. [0038], the resist pattern and the gaps between the resist pattern will be

made accurately. Therefore, Kanda's coated (smoothed resist pattern) resist pattern is reduced in size by the claimed amount.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent

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Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Daborah Chacko-Davis/
Primary Examiner, Art Unit 1795

October 1, 2010.